## REMARKS

Claims 1-2, 3-7, 12-15 and 17-36 are pending in this application. Claims 3 and 16 have previously been canceled without prejudice or disclaimer. For purposes of expedition, claims 8-11 have now been canceled without prejudice or disclaimer. Claims 1-2, 7, 12-15, 17, 21-22, 24, 26-28 and 31-36 have been amended in several particulars for purposes of clarity and brevity that are unrelated to patentability and prior art rejections in accordance with current Office policy, to further and alternatively define Applicants' disclosed invention and to assist the Examiner to expedite compact prosecution of the instant application.

Claims 1, 4, 8-14, and 22-26 have been rejected under 35 USC 103(a) as being unpatentable over Lee et al., U.S. Patent No. 5,808,735, in view of Danielson et al., U..S. Patent No. 4,926,489, and Koike et al., U.S. Patent No. 6,181,805 for reasons stated on pages 4-7 of the Office Action (Paper No. 20). Similarly, claims 1, 4, 8-14, and 22-26 have also been rejected under 35 USC 103(a) as being unpatentable over Lee '735 in view of Danielson '489, and Michael et al., U.S. Patent No. 5,640,200 for reasons stated on pages 7-10 of the Office Action (Paper No. 20). Alternatively, claims 1, 4, 8-14, and 22-26 have also been rejected under 35 USC 103(a) as being unpatentable over Lee '735, in view of Danielson '489, and Schemmel et al., U.S. Patent No. 6,504,948 for reasons stated on pages 10-12 of the Office Action (Paper No. 20). As previously indicated, claims 8-11 have been canceled without prejudice or disclaimer to render the rejection moot. To the extent that these rejections are still applicable with respect to independent claims 1 and 22 and their respective dependent claims 4, 12-14, and 23-26, Applicants respectfully

traverse these rejections (in groups) for reasons as discussed *in seriatim* herein below.

The present invention is characterized in that a defect of the patterns is detected after performing the following two steps as to first and second images, as shown in FIG. 7 (in which a pixel alignment 11 is used to align the two images within one pixel unit before brightness coincidence filtering 12 and local gradation conversion 13) and FIG. 8 (in which a pixel alignment 11 is used to align the two images within one pixel unit after local gradation conversion 13 but before brightness coincidence filtering 12). These two steps include:

(1)    Aligning the first and second images with an accuracy of one pixel unit.

(2)    Adjusting brightness of at least one of the first and second images to match a brightness of the first and second images.

For example, Applicants' base claim 1, as amended, defines a method of inspecting patterns, comprising the steps of:

> picking up a first pattern formed on a substrate to produce a first image;
> storing the first image;
> picking up a second pattern that is also formed on the substrate so as to have naturally the same shape as the first pattern, thereby producing a second image;
> aligning the first image and the second image with an accuracy of one pixel unit;
> after the first image and the second image are aligned with one pixel unit, adjusting a brightness of at least one of the first image and the second image to match a brightness of the first image with a brightness of the second image; and
> comparing the first and second images aligned and matched in brightness to detect a defect of the patterns.

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Likewise, base claim 22 defines an apparatus for inspecting defects of a

plurality of patterns formed on a substrate so as to have naturally the same shape,

comprising:

> table means on which the substrate is placed, and which can be moved in an X-Y plane;
>
> image pick-up means for picking up the patterns of the substrate placed on the table means to produce images of the patterns;
>
> proposed-defects extracting means for processing the images of the patterns when the substrate placed on the table means is continuously moved, <u>after the images of the patterns have been aligned with an accuracy of one pixel unit</u>, and <u>at least one of the images of the patterns has been subjected to gradation conversion to match a brightness of the at least one of the images with a brightness of at least one other one of the images</u>, thereby extracting proposed defects of the patterns;
>
> defect detection means for detecting true defects from the proposed defects of the patterns that have been extracted by the proposed-defects extraction means; and
>
> output means for producing information of the true defects detected by the defect detection means.

As expressly defined in Applicants' base claims 1 and 22, after the first and

second images are aligned with an accuracy of one pixel unit, as shown in FIG. 7, a

brightness of at least one of the first image and the second image is adjusted so that

a brightness of the first image is matched with a brightness of the second image.

In contrast to Applicants' base claims 1 and 22, Lee '735, as a primary

reference, discloses a completely different automatic defect classification (ADC)

method and system, as shown in FIG. 1, for detecting defects on a test surface of a

semiconductor wafer. As shown in FIG. 2A and FIG. 2B, the test image and the

reference image are aligned in the x-y plan, and then the test image and the

reference image are subtracted from one another in order to determine the presence

of a defect. Specifically, as described on column 5, lines 54-67 and column 7, lines

3-9 of Lee '735, if the intensity difference between the corresponding test and

reference pixels exceed an intensity-error threshold value, then such a test-image

pixel can be identified as a potential defect pixel that needs to be correct.

Lee '735, as correctly identified by the Examiner, does **not** disclose

Applicants' techniques of "aligning the first image and the second image with an

accuracy of one pixel unit" and then "after the first image and the second image are

aligned with one pixel unit, adjusting a brightness of at least one of the first image

and the second image to match a brightness of the first image with a brightness of

the second image" as expressly defined in Applicants' base claims 1 and 22.

Danielson '489 and Koike '805, as secondary references, do **not** remedy the

noted deficiencies of Lee '735 in order to arrive at the subject matter of Applicants'

base claims 1 and 22. Neither Danielson '489 nor Koike '805, whether taken

individually or in combination, discloses that "the first and second images are aligned

with one pixel unit" and thereafter "a brightness of at least one of the first and second

images is adjusted to match a brightness of the two images" so that a defect can be

detected as expressly defined in Applicants' base claims 1 and 22.

Danielson '489, as a secondary reference, is cited for allegedly disclosing the

use of "an alignment means for aligning first and second images (figure 1, numeral

66) with an accuracy of one pixel unit ("alignment system includes ... detection of

alignment errors in excess of +/- 1 pixel" at column 6, line 11". However, numeral

66, shown in FIG. 1 of Danielson '489 refers to an alignment correction subsystem

that is used to control the relative delay between the left and right images. See

column 9, lines 3-10 of Danielson '489. The cited column 6, lines 10-11 refers to the

use of a novel 2-dimensional phase detector for the efficient and high-speed

detection of alignment errors in excess of +/- 1 pixel. However, the detection of

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alignment errors in excess of +/- 1 pixel is completely different from "aligning the first image [picked up from a substrate] and the second image [also picked up from a substrate] with an accuracy of one pixel unit" as expressly defined in Applicants' base claims 1 and 22. Certainly, Danielson '489 does **not** disclose that "the first and second images are aligned with one pixel unit" and thereafter "a brightness of at least one of the first and second images is adjusted to match a brightness of the two images" so that a defect can be detected as expressly defined in Applicants' base claims 1 and 22.

Likewise, Koike '805, as another secondary reference, is cited for allegedly disclosing the use of "a local gradation conversion ("normalizing the brightness or lighting of the matching region" at column 14, line 47; a "region" is local within the image) of one of the first or second image (figure 20, numerals 137 and 138) to locally match a brightness of the first image with a brightness of the second image". However, Koike '805 does **not** disclose that "the first and second images are aligned with one pixel unit" and thereafter "a brightness of at least one of the first and second images is adjusted to match a brightness of the two images" so that a defect can be detected as expressly defined in Applicants' base claims 1 and 22.

In order to establish a *prima facie* case of obviousness under 35 U.S.C. §103, the Examiner must show that the prior art reference (or references when combined) must teach or suggest all the claim limitations, and that there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skilled in the art, to modify the reference or to combine reference teachings, provided with a reasonable expectation of success. The teaching or suggestion to make the claimed combination and the reasonable

expectation of success must both be found in the prior art, and **not** based on Applicants' disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP 2143. In other words, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). In addition, "obvious to try" is **not** a legitimate test of patentability. "obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination." ACS Hospital System, Inc v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). The Examiner must point to something in the prior art that suggests in some way a modification of a particular reference or a combination of references in order to arrive at Applicants' claimed invention. Absent such a showing, the Examiner has improperly used Applicants' disclosure as an instruction book on how to reconstruct to the prior art to arrive at Applicants' claimed invention.

In the present situation, Lee '735, Danielson '489 and Koike '805, whether taken individually or in combination with any other prior art of record, including Michael '200 and Schemmel '948, fail to disclose and suggest all features of Applicants' base claims 1 and 22. Therefore, Applicants respectfully request that the rejection of Applicants' base claims 1 and 22 and their respective dependent claims 4, 12-14, and 23-26 be withdrawn.

Even assuming *arguendo* that Danielson '489 and Koike '805 disclose what the Examiner alleges, Danielson '489 and Koike '805 cannot be incorporated into the automatic defect classification (ADC) method and system of Lee '735 in the manner suggested by the Examiner. This is because the automatic defect classification

(ADC) method and system of Lee '735 utilizes a different defect detection scheme based the subtraction between the test image and the reference image relative to an intensity threshold value. If the alignment is altered in the manner suggested by the Examiner, the resultant would utterly defeat the intended purpose advocated by Lee '735. Therefore, in view of the foregoing reasons and deficiencies in the proposed combination of Lee '735, Danielson '489 and Koike '805, whether taken individually or in combination with any other prior art of record, including Michael '200 and Schemmel '948, Applicants respectfully request that the rejection of Applicants' base claims 1 and 22 and their respective dependent claims 4, 12-14, and 23-26 be withdrawn.

Separately, claims 1, 5, 7, 15, 21 and 27-29 have been rejected under 35 USC 103(a) as being unpatentable over Lebeau, U.S. Patent No. 5,204,910, in view of Kobayashi et al., U.S. Patent No. 4,669,123, Danielson et al., U.S. Patent No. 4,926,489 and Koike et al., U.S. Patent No. 6,181,805 for reasons stated on pages 12-17 of the Office Action (Paper No. 20). Likewise, claims 1, 5, 7, 15, 21 and 27-29 have been rejected under 35 USC 103(a) as being unpatentable over Lebeau '910, in view of Kobayashi '123, Danielson '489 and Michael '200 for reasons stated on pages 17-21 of the Office Action (Paper No. 20). Alternatively, claims 1, 5, 7, 15, 21 and 27-29 have also been rejected under 35 USC 103(a) as being unpatentable over Lebeau '910, in view of Kobayashi '123, Danielson '489 and Schemmel et al., U.S. Patent No. 6,504,948 for reasons stated on pages 22-26 of the Office Action (Paper No. 20). Again, the rejections of Applicants' base claim 1 and its dependent claim 5 are respectfully traversed for the same reasons discussed above. To the extent that the rejections still applicable with respect to independent claim 7, 15 and 27 and their

respective dependent claims 21 and 28-29, Applicants respectfully traverse these

rejections for additional reasons as discussed *in seriatim* herein below.

Base claim 7, as amended, defines a method of inspecting a pattern,

comprising the steps of:

picking up a first pattern formed on a substrate to produce a first
image;
storing the first image;
picking up a second pattern that is formed on the substrate so
as to have naturally the same shape as the first pattern, thereby
producing a second image;
aligning the first image and the second image with an accuracy
of one pixel unit;
after the first image and second image are aligned with one pixel
unit, adjusting a brightness of at least one of the first image and the
second image by collectively filtering the first image and the second
image to match the brightness of the two images;
performing gradation conversion of at least one of the first
image and the second image to match a brightness of the first image
with a brightness of the second image;
comparing the first and second images to detect a defect and to
obtain features of the detected defect; and
displaying information of the features of the detected defect on a
screen.

Likewise, base claim 15, as amended, defines an apparatus for inspecting

defects of patterns, comprising:

image pick-up means for picking up a first pattern formed on a
substrate and a second pattern that is also formed on the substrate so
as to have naturally the same shape as the first pattern, thereby
producing a first image of the first pattern and a second image of the
second pattern;
storage means for storing the first image;
alignment means for aligning the first image and the second
image with an accuracy of one pixel unit;
brightness conversion means for adjusting a brightness of at
least one of the first image and the second image by collectively
filtering the first and second images to match a brightness of the two
images;
gradation conversion means for performing gradation
conversion of at least one of the first image and the second image to

match a brightness of the first image with a brightness of the second
image;
defect detection means for comparing the first and second
images, at least one of which has a brightness which has been
corrected by the gradation conversion means, thereby detecting
defects of the patterns; and
output means for producing information of the defects of the
patterns detected by the defect detection means.


Alternatively, base claim 27, as amended, defines an apparatus for inspecting

defects of patterns, comprising:

image pick-up means for picking up a first pattern formed on a
substrate and a second pattern that is formed on the substrate so as to
have naturally the same shape as the first pattern, thereby producing a
first image of the first pattern and a second image of the second
pattern;
storage means for storing the first image;
defect detection means for correcting at least one of the first
image and the second image by performing gradation conversion of at
least one of the first image and the second image to match a
brightness of the first image with a brightness of the second image,
aligning the first image and the second image with an accuracy of one
pixel unit, collectively filtering the first image and the second image to
match a brightness of the first image with a brightness of the second
image, comparing the first image and the second image aligned and
matched in brightness to detect defects, and then estimating
information of the detected defects; and
display means for displaying on a screen the defects detected
by the defect detection means, and the information of the detected
defects.


As expressly defined in Applicants' base claims 7, 15 and 27, after the first

and second images are aligned with an accuracy of one pixel unit, as shown in FIG.

7, the brightness adjustment is made as follows:

(1)    Adjusting brightness of at least one of the first and second images by

collectively filtering the first and second images to match a brightness of the two

images (All the images are passed through a filter at a time so that the brightness of

one image coincides with that of the other, shown in FIG. 7, block 11. Refer to the description from page 11, line 23 to page 12, line 10.).

(2)     Performing gradation conversion of at least one of the first and second images to match a brightness of the first image with a brightness of the second image (Adjustment of the brightness is performed for each area smaller than that of the adjustment made above by correcting gain and offset. Refer FIG. 7, block 13).

In contrast to Applicants' base claims 7, 15 and 27, Lebeau '910, Kobayashi '123, Danielson '489 and Koike '805, whether taken individually or in combination, fail to disclose and suggest all features of Applicants' base claims 7, 15 and 27. Therefore, Applicants respectfully request that the rejection of Applicants' base claims 1, 7, 15 and 27 and their respective dependent claims 21 and 28-29 be withdrawn.

Claims 15, 18 and 20 have been rejected under 35 USC 103(a) as being unpatentable over Wihl, U.S. Patent No. 4,633,504 in view of Danielson '489 and Koike '948 for reasons stated on pages 26-29 of the Office Action (Paper No. 20). Likewise, claims 15, 18 and 20 have been rejected under 35 USC 103(a) as being unpatentable over Wihl '504 in view of Danielson '489 and Michael '200 for reasons stated on pages 29-31 of the Office Action (Paper No. 20). Alternatively, claims 15, 18 and 20 have been rejected under 35 USC 103(a) as being unpatentable over Wihl '504 in view of Danielson '489 and Schemmel '948 for reasons stated on pages 32-34 of the Office Action (Paper No. 20). Again, Applicants respectfully traverse these rejections for additional reasons as discussed herein below.

Base claim 15, as amended, defines an apparatus for inspecting defects of patterns, comprising:

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image pick-up means for picking up a first pattern formed on a substrate and a second pattern that is also formed on the substrate so as to have naturally the same shape as the first pattern, thereby producing a first image of the first pattern and a second image of the second pattern;

storage means for storing the first image;

alignment means for aligning the first image and the second image with an accuracy of one pixel unit;

brightness conversion means for adjusting a brightness of at least one of the first image and the second image by collectively filtering the first and second images to match a brightness of the two images;

gradation conversion means for performing gradation conversion of at least one of the first image and the second image to match a brightness of the first image with a brightness of the second image;

defect detection means for comparing the first and second images, at least one of which has a brightness which has been corrected by the gradation conversion means, thereby detecting defects of the patterns; and

output means for producing information of the defects of the patterns detected by the defect detection means.

In contrast to Applicants' base claim 15, Wihl '504, Kobayashi '123, Danielson '489 and Koike '805, whether taken individually or in combination with any other prior art of record, fail to disclose and suggest all features of Applicants' claim 15. Therefore, Applicants respectfully request that the rejection of Applicants' base claim 15 and its respective dependent claims 18 and 20 be withdrawn.

Dependent claims 6, 19 and 30 have been rejected under 35 USC 103(a) as being unpatentable over Lebeau '910 in view of Kobayashi '123, Daneilson '489 and Koike '948, as applied to claims 1, 15 and 27 above, and further in view of Wagner et al., U.S. Patent No. 5,659,172 for reasons stated on pages 34-35 of the Office Action (Paper No. 20). Likewise, claims 6, 19 and 30 have been rejected under 35 USC 103(a) as being unpatentable over Lebeau '910 in view of Kobayashi '123, Daneilson '489 and Schemmel '948, as applied to claims 1, 15 and 27 above, and further in

view of Wagner et al., U.S. Patent No. 5,659,172 for reasons stated on pages 36-37 of the Office Action (Paper No. 20).

Dependent claims 2 and 17 have been rejected under 35 USC 103(a) as being unpatentable over Lebeau '910 in view of Kobayashi '123, Daneilson '489 and Koike '948, as applied to claims 1 and 15 above, and further in view of Hasketll et al., U.S. Patent No. 6,111,596 for reasons stated on pages 37-38 of the Office Action (Paper No. 20). Likewise, claims 2 and 17 have also been rejected under 35 USC 103(a) as being unpatentable over Lebeau '910 in view of Kobayashi '123, Daneilson '489 and Michael '200, as applied to claims 1 and 15 above, and further in view of Haskell et al., U.S. Patent No. 6,111,596 for reasons stated on pages 39-40 of the Office Action (Paper No. 20). Alternatively, claims 2 and 17 have been rejected under 35 USC 103(a) as being unpatentable over Lebeau '910 in view of Kobayashi '123, Daneilson '489 and Schemmel '200, as applied to claims 1 and 15 above, and further in view of Haskell et al., U.S. Patent No. 6,111,596 for reasons stated on pages 37-38 of the Office Action (Paper No. 20).

Lastly, dependent claims 31, 33 and 35 have been rejected under 35 USC 103(a) as being unpatentable over Lee '735 in view of Daneilson '489 and Koike '948, as applied to claims 1, 8 and 22 above, and further in view of Teo, U.S. Patent No. 6,128,108 for reasons stated on pages 42-44 of the Office Action (Paper No. 20). Likewise, claims 31, 33 and 35 have been rejected under 35 USC 103(a) as being unpatentable over Lebeau '910 in view of Kobayashi '123, Daneilson '489 and Koike '948, as applied to claims 7, 15 and 27 above, and further in view of Teo, U.S. Patent No. 6,128,108 for reasons stated on pages 42-44 of the Office Action (Paper No. 20).

Since the correctness of these rejections is predicated upon the correctness of the rejections of Applicants' base claims 1, 7, 15, 22 and 27, Applicants respectfully traverse these rejections for the same reasons discussed against the rejections of Applicants' base claims 1, 7, 15, 22 and 27.

In view of the foregoing amendments, arguments and remarks, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Should any questions remain unresolved, the Examiner is requested to telephone Applicants' attorney at the Washington DC area office at (703) 312-6600.
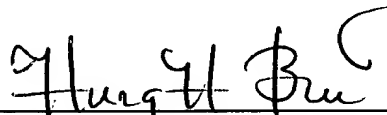
## INTERVIEW:

In the interest of expediting prosecution of the present application, Applicants respectfully request that an Examiner interview be scheduled and conducted. In accordance with such interview request, Applicants respectfully request that the Examiner, after review of the present Amendment, contact the undersigned local Washington, D.C. area attorney at the local Washington, D.C. telephone number (703) 312-6600 for scheduling an Examiner interview, or alternatively, refrain from issuing a further action in the above-identified application as the undersigned attorneys will be telephoning the Examiner shortly after the filing date of this Amendment in order to schedule an Examiner interview. Applicants thank the Examiner in advance for such considerations. In the event that this Amendment, in and of itself, is sufficient to place the application in condition for allowance, no Examiner interview may be necessary.

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage of fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account of Antonelli, Terry, Stout & Kraus, No. 01-2135 (Application No. 500.37149X00), and please credit any excess fees to said deposit account.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

By _____
Hung H. Bui (Reg. No. 40,415)
Attorney for Applicant(s)

HHB:btd

1300 North Seventeenth Street, Suite 1800
Arlington, Virginia 22209
Tel.: (703) 312-6600
Fax: (703) 312-6666